Translating the Diabetes Prevention Program Into Practice in the General Community: Findings From the Montana Cardiovascular Disease and Diabetes Prevention Program

Helen A. Amundson, Marcene K. Butcher, Dorothy Gohdes, Taryn O. Hall, Todd S. Harwell, Steven D. Helgerson, Karl K. Vanderwood and for the Montana Cardiovascular Disease and Diabetes Prevention Program Workgroup

The Diabetes Educator 2009; 35; 209
DOI: 10.1177/0145721709333269

Translating the Diabetes Prevention Program Into Practice in the General Community

Findings From the Montana Cardiovascular Disease and Diabetes Prevention Program

professional development

Purpose

The purpose of this study was to evaluate the feasibility of translating the Diabetes Prevention Program (DPP) lifestyle intervention into practice in the general community.

Methods

In 2008, the Montana Diabetes Control Program, working collaboratively with 4 health care facilities, implemented an adapted group-based DPP lifestyle intervention. Adults at high risk for diabetes and cardiovascular disease were recruited and enrolled (n = 355). Eighty-three percent (n = 295) of participants completed the 16-session program. Participants set targets to reduce fat intake and increase physical activity (≥150 minutes per week) to achieve a weight loss goal of 7%.

Results

Seventy percent of participants achieved the physical activity goal of ≥150 minutes per week. There was a significant decrease among participants' weight from baseline (mean ± SD, 99.3 ± 19.7 kg) to week 16 (92.6 ± 18.8 kg; mean difference, 6.7 ± 4.0 kg, $P < .001$). Forty-five percent of the participants achieved the 7% weight loss goal, and 67% achieved at least 5% weight loss. Participants who were 60 years of age and older, had a diagnosis of hypertension, met their physical activity

Helen A. Amundson, RN, BSN, CDE

Marcene K. Butcher, RD, CDE

Dorothy Gohdes, MD

Taryn O. Hall, MPH

Todd S. Harwell, MPH

Steven D. Helgerson, MD, MPH

Karl K. Vanderwood, MPH

for the Montana Cardiovascular Disease and Diabetes Prevention Program Workgroup*

*Members of the Montana Diabetes and Cardiovascular Disease Program are listed in the appendix. The writing group takes responsibility for the content of this article.

Correspondence to Todd S. Harwell, MPH, Montana Department of Public Health and Human Services, Cogswell Building, C-314, PO Box 202951, Helena, MT 59620-2951 (tharwell@mt.gov).

Acknowledgments: We thank Susan Day from the Montana Department of Public Health and Human Services for her programmatic and fiscal support of this project. This project was funded through the Montana State Legislature and supported by a cooperative agreement with the Centers for Disease Control and Prevention, Division of Diabetes Translation (U32/CCU822743-05), Atlanta, Georgia. The contents of this report are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

DOI: 10.1177/0145721709333269

goal of ≥150 minutes per week, and those more frequently monitoring their fat intake were more likely to meet the 7% weight loss goal compared with participants without these characteristics.

Conclusion

The findings suggest that it is feasible to recruit and retain high-risk participants and achieve weight loss and physical goals in a group setting that are comparable with those achieved in the DPP.

With increasing rates of obesity in the United States, type 2 diabetes and cardiovascular disease threaten the long-term health of many communities. The lifetime risk of developing diabetes for individuals born in 2000 has been estimated to be almost 33%.[1] The Diabetes Prevention Program (DPP) provided compelling evidence that diabetes could be prevented and cardiometabolic risk factors reduced among individuals at high risk for diabetes and cardiovascular disease.[2-4] The well-defined intensive lifestyle intervention was more effective than metformin.[5] Subsequent analyses showed that the both interventions were cost-effective, although metformin was not considered cost-effective among participants aged 65 years and older.[6,7] Programs to translate the DPP lifestyle intervention have been piloted in a number of settings, including the Young Men's Christian Association (YMCA) in Indiana, a hospital-based program in Massachusetts, a work site in Utah, churches in the Southeastern United States, underserved communities in Pittsburgh, family medicine patients in Buffalo, and on American Indian reservations in the United States.[8-14] Yet despite numerous calls to integrate intensive lifestyle interventions into routine preventive care for overweight adults with cardiometabolic risk factors, community resources supporting evidence-based intensive lifestyle interventions for high-risk individuals are lacking in the United States.[15-18]

Recognizing the importance of implementing the intensive lifestyle intervention demonstrated to be effective in the DPP, the Montana Diabetes Control Program developed a pilot program adapting and implementing the DPP intervention in 4 Montana communities in 2008. A survey of Montana primary care clinicians conducted in 2006 showed that they frequently assessed cardiometabolic risk and recognized the importance of risk reduction but lacked resources to implement lifestyle interventions.[19] The goal of this project was to assess the feasibility of translating the DPP in community settings targeting persons at high risk for diabetes and cardiovascular disease. This report describes the development of this program and the weight loss outcomes for the initial cohort of participants after completing the core 16-week lifestyle intervention along with information about meeting physical activity and fat intake goals.

Methods

In 2007, the Diabetes Control Program, part of the Montana Department of Public Health and Human Services, issued a request for proposals using funding provided by the Montana State Legislature to implement a cardiometabolic risk reduction intervention based on the DPP. Four health care facilities, all of which were associated with diabetes education programs recognized by the American Diabetes Association as meeting the National Standards for Diabetes Self-management Education, were funded to implement the program beginning in January 2008. Three of the facilities are located in small urban counties with 2006 county census populations ranging from 55 716 to 129 352.[20] The fourth facility is located in a frontier county with a 2006 census population of 11 696. One site is a collaboration between the local hospital, a local health department, and a federally qualified community health center. Clinicians at the community health center identify eligible patients and refer them to the staff at the hospital where the intervention is conducted. A second site is a collaboration between the local health care facility and the YMCA. Program staff from the health care facility are housed at the YMCA where the intervention is conducted. The remaining 2 programs are housed in the local outpatient care facilities. Each participating site was funded for 1 full-time equivalent (FTE) lifestyle coach and a one-quarter–equivalent support staff. The lifestyle coach was generally a shared position filled by a 0.5-FTE dietitian and a 0.5-FTE health professional with education and training in exercise sciences. Lifestyle coaches from each site participated in a 2-day training led by 2 DPP site

coordinators with experience in the original study and its community implementation. The training focused on implementing the DPP curriculum in a group setting and standardized procedures for collecting anthropometric measures.

Participants

Adults aged 18 years and older, who were overweight (body mass index [BMI] ≥25 kg/m^2), and had 1 or more of the following risk factors for diabetes or cardiovascular disease were eligible to participate in the program with medical clearance from their primary care provider: a previous diagnosis of prediabetes, impaired glucose tolerance or impaired fasting glucose, high blood pressure (≥130/85 mm Hg or treatment) or dyslipidemia (triglycerides >150 mg/dL, low-density lipoprotein cholesterol >130 mg/dL or treatment, or high-density lipoprotein [HDL] cholesterol <40 mg/dL for men and <50 mg/dL for women), a history of gestational diabetes (GDM), or having given birth to a baby of greater than 9 lb (4.1 kg). Participants' readiness to change their physical activity and dietary intake was assessed using questions identified from various motivational interviewing instruments. In addition, each participant was required to sign a commitment contract indicating that they were ready to take action to reach their weight loss goals. Persons were not eligible to participate in the program if they were diagnosed with diabetes, unstable cardiac disease, cancer and currently undergoing treatment, end-stage renal disease or currently on dialysis, unable to participate in regular moderate physical activity, or were pregnant or planning to become pregnant in the next 6 months.

During the initial 6-month period for this project, the goal for each site was to recruit and enroll 100 eligible participants into the program with a minimum of 50 participants completing the core 16-session lifestyle intervention. Each of the 4 sites used prospective and retrospective strategies to recruit potential participants, including contacting local physicians (eg, primary care providers, obstetricians, and gynecologists) to identify eligible patients, advertising through paid and earned media (eg, newspaper advertisements, press releases, community access television), and recruiting through local employers, work sites, churches, and service groups. Each potential participant was required to have his or her primary care provider complete an eligibility and medical clearance form indicating that the person met the specific eligibility criteria for the program and had no known condition that would make it unsafe for him or her to participate. Two of the sites charged a fee to persons participating in the program ($50 and $150), but all of the sites were required to accept all eligible persons regardless of their ability to pay for the service. The site charging $50 per participant returned $25 to participants after completing the 16-week sessions and the remaining $25 upon completing the follow-up sessions. The site charging $150 per participant used the funds to support program staffing and implementation.

Adapted DPP Intervention

The DPP core lifestyle intervention was adapted and implemented as a group-based program, and the curriculum was provided through 16 weekly sessions.[5] Our adapted program focused on the same goals as the DPP (7% weight loss and moderately intense physical activity for ≥150 minutes per week). After completion of the 16-session core intervention, enrollees continued to participate in monthly group sessions over a 6-month period led by the lifestyle coaches. The group size across sites ranged from 8 to 34 participants. Each group session was approximately 1 hour in length. The sessions were designed to be participatory and interactive and included guided nutrition and physical activity demonstrations to engage participants. The curriculum was based on an adaptation of the original DPP curriculum developed by Healthy Native Community Partnership.[21] The physical activity components of the curriculum began in week 5. Participants began to monitor and log their weekly activity then. During the core sessions, each group also had the opportunity to participate in 2 weekly structured physical activity events (eg, walking groups, swimming, using the cardiac rehabilitation exercise facility).

Data Collection and Outcomes

As part of enrollment into the program, the lifestyle coaches conducted an initial assessment including the measurement of each participant's height, weight, and blood pressure. Referring physicians were asked to provide information regarding the participant's blood glucose, lipid values, current medications for hypertension and dyslipidemia, and current medications for weight loss or prediabetes (eg, metformin). Participants were

reassessed at the conclusion of the 16-week core curriculum and after completion of the 6 monthly group follow-up visits. Participants were considered to have not completed the 16-week core program if they dropped out or if they missed more than 3 consecutive core sessions.

Participants were instructed to monitor and document daily fat intake and weight beginning at session 2, physical activity at session 5, and, if necessary, calories at session 7, per DPP monitoring guidelines. Participant self-monitoring measures were collected by the lifestyle coach on a weekly basis and included fat gram intake, calorie intake, physical activity minutes, and weight. These values were reported as a weekly average. Participants who self-monitored their weight, fat grams, physical activity minutes, and calorie intake 4 or more days per week were considered regular self-monitors. The lifestyle coach also weighed each participant at the beginning of each core and follow-up session.

Data Analysis

Each participating site provided deidentified data to the state diabetes program for data analyses monthly. These data were analyzed to provide prompt feedback to each site regarding enrollment and participants lost to follow-up, self-monitoring measures, and outcomes (weight loss and physical activity minutes).

To assess self-monitoring goal achievement, a self-monitoring score was constructed for each self-monitoring component (eg, fat grams, calories, and weight). It was assumed that participants who did not attend visits or did not turn in records were not self-monitoring and did not meet goals. Fat gram intake was the average of daily intake self-reported in the participant food record. A participant was considered to have met the physical activity goal if his or her average physical activity over the 16-week core was at least 150 minutes per week. Final weight was defined as the last weight assessed during the 16-week core curriculum.

Data analyses were completed using Statistical Analysis Software Version 9 (Cary, NC). The analyses and results presented in this report will focus on the weight loss outcomes from the 16-session lifestyle intervention. All linear predictor and response variables were assessed for normal distribution, and outliers were excluded. Log transformations were performed on intake and follow-up triglyceride variables. Paired *t* tests were used to assess weight loss from initial weight to final weight at the end of the 16-week curriculum. Chi-square statistics were used to compare weight loss and physical activity goal achievement by gender, BMI (25-29 kg/m^2, 30-34 kg/m^2, 35-39 kg/m^2, and 40+ kg/m^2), age group (<60 years, 60+ years), and risk factors. Logistic regression models were used to determine variables that were independently associated with achieving the 7% weight loss goal.

Results

Three hundred fifty-five participants were enrolled in the program, and 293 (83%) completed the 16-week core curriculum. Participants attended an average of 14.5 ± 2.0 sessions. Forty-three percent of participants attended all 16 sessions, and 91% attended 12 or more sessions. There were no significant associations between number of classes attended and age, sex, or BMI (data not shown). The mean ± SD age of participants was 53.6 ± 9.7 years, 20% were men, the mean weight at baseline was 99.3 ± 20.0 kg, and the mean BMI was 35.9 ± 6.5 kg/m^2 (Table 1). Seven percent of participants were taking a weight loss medication at baseline (n = 21).

Participants not completing the lifestyle intervention (62 of 355) were significantly less likely to have been diagnosed with hypercholesterolemia (P = .01); less likely to have had a previous diagnosis of prediabetes, impaired glucose tolerance, or impaired fasting glucose (P = .002); and less likely to have had elevated total cholesterol levels (P = .004), and they were significantly more likely to have had lower HDL levels at intake (P = .004) compared with participants completing the lifestyle intervention (data not shown).

Fat Intake and Physical Activity Self-monitoring

Self-monitoring records of dietary fat intake were complete for an average of 10.1 ± 4.0 weeks (range, 0-14 weeks). Men were significantly more likely to complete dietary fat records compared with women (mean, 11.6 ± 3.2 weeks vs 9.7 ± 4.1 weeks, P = .001). Age was also associated with self-monitoring of dietary fat; adjusting for gender, participants 60 years or older completed significantly more dietary fat self-monitoring records (11.5 ± 4.1 weeks) than did participants younger than 60 years (10.3 ± 4.7 weeks, P = .02). Participant BMI at baseline was not associated with mean number of dietary

Table 1

Baseline Characteristics of Participants Completing Lifestyle Intervention, Montana Cardiovascular Disease and Diabetes Prevention Program, 2008 (N = 293)

	Mean (SD)
Age, y	53.6 (10.5)
Body mass index, kg/m^2	35.9 (6.5)
Weight, kg	99.3 (19.7)
	% (n)
Gender	
Male	20 (60)
Female	80 (233)
Family history of diabetes	39 (111)
History of gestational diabetes	7 (19)
History of baby >9 lb (4.1 kg)	14 (41)
Prediabetes, impaired fasting glucose, impaired glucose tolerance	52 (141)
Diagnosed hypertension	54 (150)
Triglycerides ≥150 mg/dL	40 (118)
Low high-density lipoprotein cholesterol[a]	59 (174)
Elevated low-density lipoprotein cholesterol[b]	61 (160)
Elevated total cholesterol[c]	52 (136)

[a] High-density lipoprotein cholesterol ≤40 mg/dL for men or ≤50 mg/dL for women.
[b] Low-density lipoprotein cholesterol ≥130 mg/dL or taking medication.
[c] Total cholesterol ≥200 mg/dL or taking medication.

fat records completed. The mean daily fat intake decreased significantly: –6.0 ± 18.2 g (range, –3.7 to –12.1 g) from week 3 to the last reported fat gram intake.

Participants reported completing a mean of 232 ± 128 minutes of physical activity per week at the end of the core curriculum. Seventy percent of participants achieved the goal of ≥150 minutes per week, based on mean physical activity at the end of the core sessions. The mean physical activity minutes increased significantly from 210 ± 160 minutes among participants at week 6 to 290 ± 192 minutes at week 16 ($P < .001$; Figure 1). Men averaged 280 ± 152 minutes of physical activity per week, significantly higher than women (219 ± 118 minutes per week, $P = .005$). Eighty-five percent of men (50 of 59) achieved the goal of ≥150 minutes per week versus 67% of women (150 of 225, $P = .007$). After adjustment, gender and self-monitoring behavior were independently associated with success at achieving the physical activity goal. Men were twice as likely to have met the physical activity goal compared with women (odds ratio [OR], 2.43; 95% confidence interval [CI], 1.10-5.35). Participants who self-monitored dietary fat for at least 14 weeks were 7 times more likely to have met the physical activity goal (OR, 7.00; 95% CI, 2.75-17.78), and participants who self-monitored for 7 to 13 weeks were 3 times more likely to have met the physical activity goal (OR, 3.07; 95% CI, 1.54-6.11) than participants who monitored dietary fat less often.

Weight Loss

The mean participant weight at baseline was 99.3 ± 19.7 kg (range, 58.2-180.1 kg). At the end of the core curriculum, participants' mean weight was 92.6 ± 18.8 kg ($P < .0001$). The average weight loss per participant was 6.7 ± 4.0 kg (range, –18.0 kg to +2.8 kg), or 6.7% of initial body weight. There was a significant reduction in BMI from 35.9 ± 6.5 kg/m^2 at baseline to 33.5 ± 6.3 kg/m^2 at week 16 ($P < .001$). Ninety-seven percent of participants lost weight (285 of 293). Forty-five percent of the participants (133 of 293) achieved the 7% weight loss goal, and 67% (195 of 293) achieved at least 5% weight loss.

Men lost an average of 8.7 ± 4.2 kg, or 7.9% of initial body weight, significantly more than did women, who lost an average of 6.2 ± 6.0 kg, or 6.3% of initial body weight ($P = .02$). In the crude analysis, men were twice as likely to have met the 7% weight loss goal as compared with women (OR, 1.83; 95% CI, 1.03-3.26). However, when adjusted for self-monitoring of dietary fat and average minutes of physical activity, this association was not significant ($P = .36$). There was no association between weight loss and initial BMI. There were statistically significant reductions in mean weight in older and younger participants, among participants with individual risk factors for diabetes and cardiovascular disease, among participants at each individual health care facility, and among the smaller and larger participant groups (Table 2). Mean weight loss was highest among participants who self-monitored fat intake more frequently and among participants who met their physical activity goals compared with participants who monitored their fat

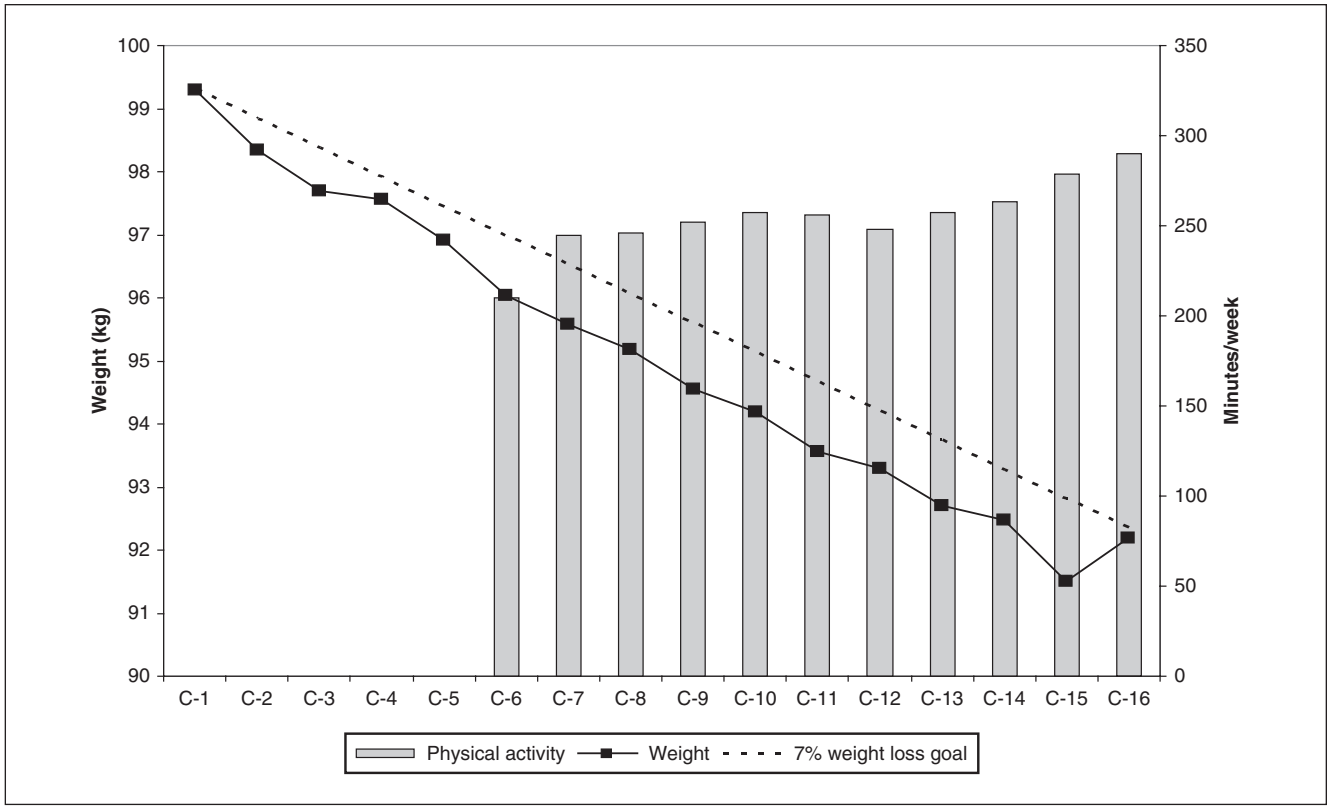

Figure 1. Mean weight and physical activity minutes per week among participants by lifestyle intervention session, Montana Cardiovascular Disease and Diabetes Prevention Program, 2008.

intake less frequently and did not meet their physical activity goals.

In multivariate analysis, factors that remained independently associated with achieving the 7% weight loss goal were age >60 years, physician diagnosis of hypertension, increased frequency of dietary fat self-monitoring, and having met the physical activity goal. Among those not diagnosed with hypertension, participants older than 60 years were 50% more likely to achieve the 7% weight loss goal than were participants younger than 60 years (OR, 1.52; 95% CI, 1.11-2.10). Among those diagnosed with hypertension, participants 60 years or older were twice as likely to achieve the 7% weight loss goal as compared with participants who were younger than 60 years of age (OR, 2.23; 95% CI, 2.06-2.40). Participants who achieved the physical activity goal were twice as likely to also achieve the weight loss goal, as were participants who did not achieve the physical activity goal (OR, 2.1; 95% CI, 1.43-5.02). Participants who self-monitored dietary fat intake every week were 8 times more likely to achieve the weight loss goal (OR, 7.60; 95% CI, 2.75-21.01), and participants who self-monitored fat for 7 to 13 weeks were 4 times more likely to achieve the weight loss goal (OR, 3.75; 95% CI, 1.54-9.20) than were participants who self-monitored fat less frequently.

Discussion

Our findings suggest that implementing the core DPP lifestyle program (adapted for a group setting) in several different community settings is feasible and effective for persons at high risk for diabetes and cardiovascular disease. Participants in this program achieved the magnitude of weight loss and physical activity associated with the prevention of diabetes and the reduction of cardiometabolic risk factors found in the DPP. It was also possible to recruit a large number of high-risk patients who could benefit from an intense lifestyle intervention without imposing specific diabetes screening tests or conducting screening events.

Overall, 45% of participants achieved the goal of weight loss of 7% or more, and 70% achieved the physical

Table 2

Weight Loss Among Subgroups of Participants Completing the Lifestyle Intervention, Montana Cardiovascular Disease and Diabetes Prevention Program, 2008

Characteristic	Weight, kg		Mean Difference, kg
	Baseline Mean (SD)	Follow-up Mean (SD)	
Gender			
Male (n = 60)	110.6 (21.2)	102.0 (20.4)	–8.6
Female (n = 233)	96.4 (18.6)	90.2 (17.7)	–6.2
Age, y			
<60 (n = 205)	100.9 (20.2)	94.2 (19.1)	–6.7
60+ (n = 86)	95.8 (19.3)	89.0 (17.9)	–6.8
History of gestational diabetes or baby >9 lb (4.1 kg) (n = 48)	96.3 (16.6)	89.4 (15.5)	–6.9
Prediabetes, impaired fasting glucose, impaired glucose tolerance (n = 141)	101.4 (17.6)	94.1 (16.6)	–7.3
Diagnosed hypertension (n = 150)	101.8 (20.6)	95.5 (19.6)	–6.3
Triglycerides ≥150 mg/dL (n = 118)	99.4 (19.5)	92.8 (18.4)	–6.6
Low high-density lipoprotein cholesterol[a] (n = 174)	102.6 (21.5)	95.9 (20.3)	–6.7
High low-density lipoprotein cholesterol[b] (n = 160)	97.7 (19.9)	90.7 (18.4)	–7.0
Self-monitoring fat			
14 wk (n = 65)	98.6 (18.7)	89.2 (16.8)	–9.4
7 to 13 wk (n = 174)	99.3 (19.8)	92.5 (18.6)	–6.8
0 to 6 wk (n = 54)	100.4 (22.5)	97.2 (21.2)	–3.2
Physical activity goal[c]			
Unmet (n = 84)	100.5 (20.1)	95.1 (19.2)	–5.4
Met (n = 200)	98.9 (19.9)	91.4 (18.5)	–7.5
Group size			
Large (17-34) (n = 180)	100.2 (20.5)	93.4 (19.6)	–6.8
Small (<17) (n = 96)	99.4 (19.5)	92.4 (17.9)	–7.0
Site			
1 (n = 87)	97.4 (18.1)	90.7 (16.6)	–6.7
2 (n = 53)	99.4 (19.7)	92.8 (18.4)	–6.6
3 (n = 69)	99.4 (20.7)	93.2 (19.7)	–6.2
4 (n = 84)	101.0 (21.6)	94.1 (20.6)	–6.9

[a] High-density lipoprotein cholesterol ≤40 mg/dL for men or ≤50 mg/dL for women.
[b] Low-density lipoprotein cholesterol ≥130 mg/dL or taking medication.
[c] Goal met = ≥150 minutes of physical activity per week. Weight loss in each subgroup was statistically significant at $P < .05$.

activity goal of 150 minutes or more per week. Our findings are comparable with those from the DPP, in which 50% of participants met their weight loss goal and 74% met their physical activity goals upon completion of the 16-session core intervention.[2] A recent translation study by Boltri and colleagues[11] targeting persons with prediabetes reported significant weight loss (mean weight loss of 7.5 lb [3.5 kg], mean BMI reduction of 1.2 kg/m^2) and improvements in blood pressure and blood glucose levels among participants after completing the 16-week intervention. Similarly, Seidel and colleagues[12] reported that 26% of participants in their translation program that targeted persons with metabolic syndrome met the 7% weight loss goal, and they also found significant improvement in the triglyceride and blood pressure values among participants. Weight loss achieved by Montana participants was comparable with that found in the DEPLOY and the Weight Loss Maintenance studies.[22,23]

The activities in Montana, although based on the DPP lifestyle intervention, were designed for use in community settings. There are several important aspects of this program that distinguish it from the original DPP. First, recruitment of participants was not limited to persons with prediabetes diagnosed with an oral glucose tolerance test. Rather, the referral of overweight adults with 1 or more risk factors for diabetes and/or cardiovascular disease was encouraged. The formal diagnosis of metabolic syndrome was not included, but traits were used such as low HDL cholesterol, high triglyceride levels, and hypertension to indicate characteristics that predict an elevated risk for diabetes in long-term community studies.[24] In addition, efforts were made to recruit women at high risk for diabetes, including those with a history of GDM or a live birth of an infant weighing more than 9 lb (4.1 kg). This was done in part to broaden the subpopulation of adult participants who could potentially benefit from this intervention. This approach is supported by a recently published call to action from the American Diabetes Association and the American Heart Association acknowledging the importance of addressing individuals' global risk for cardiovascular disease and diabetes.[18] Current guidelines recommend lifestyle interventions because modest weight loss and increased physical activity benefit persons with cardiometabolic risk factors, and weight reduction also improves cardiometabolic risk factors.[25,26] Broadening the eligibility and relying on physician referrals avoided the potential barriers and additional cost related to diabetes screening events, blood testing, and follow-up. Second, the Montana Program was implemented in a group setting compared with the 1-on-1 intervention described in the DPP. This approach, coupled with a readiness-to-change assessment, was both acceptable to participants (eg, relatively few participants were lost to follow-up) and effective in meeting the program goals.

There are a number of limitations to our findings. First, a time-series evaluation was conducted, and there was no comparison group. Second, self-reported physical activity and diet measures were collected as part of the intervention. Although these data sources may be biased, participant weight loss was similar to that found in other studies. Third, our initial findings include only the short-term follow-up, and it is likely that participants will experience some weight regain after the intense intervention, similar to what has been found in the DPP.[2] However, both the Finnish Diabetes Prevention Study and the Da Quing Study from China found long-term benefits after their initial lifestyle interventions.[27,28]

Implications

Effective lifestyle interventions will be needed, not only for diabetes prevention and cardiovascular risk reduction but also for therapy for new onset diabetes. Both the American Association of Clinical Endocrinologists and the Endocrine Society have recently recommended lifestyle as first-line therapy for reducing cardiometabolic risk.[29,30] Follow-up from the United Kingdom Prospective Diabetes Study showed the important legacy of metabolic control at onset of diabetes, and lifestyle intervention with associated weight loss is first-line therapy.[31]

There are a number of potential challenges and solutions to having these types of intervention programs available in communities in Montana and elsewhere in the United States. First, services must be billable and reimbursable by public and private insurers and included as a benefit in self-insured employer packages. If intensive lifestyle programs are not reimbursed for services, they will not likely be sustainable. Supported by their documented experience, the authors will be initiating discussions in Montana to address this issue. This is also supported by a recent study suggesting that cost-sharing strategies to offer the DPP lifestyle intervention for persons aged 50 to 64 years could provide financial return on investment for private payers and long-term

benefits for Medicare.[32] Second, the authors are developing minimum program standards for these services in Montana, similar to those created nationally for diabetes self-management education programs recognized by the American Diabetes Association.[33] These standards can be used as a framework by facilities in the state interested in developing and implementing a program consistent with the DPP. Diabetes educators and diabetes education programs are community resources with the expertise and ability to implement lifestyle interventions. Their referral relationships with community physicians are in place and can be expanded to include referrals of patients with cardiometabolic risk factors, as have been demonstrated. Ultimately, it would be useful to have national standards for these programs to ensure consistency across programs in the United States. Finally, our findings indicate that community-based programs to reduce diabetes and cardiovascular disease can be implemented with the support of state diabetes control programs. In Montana, such support included technical assistance and training, advocacy regarding billing and reimbursement by insurers, data collection and analysis, and program evaluation. These collaborative activities may provide one effective strategy for clinical and public health systems to meet the growing challenge of obesity, diabetes, and cardiovascular disease.

Appendix

The following persons were members of the Montana Cardiovascular Disease and Diabetes Prevention Program Workgroup.

Community Medical Center, Missoula, Montana

Nancy R. Eyler, MD, FACP, Marjorie J. Samsoe, MA, CDE, and Shirley K. Schneiter, RD, CDE

Holy Rosary Healthcare, Miles City, Montana

Kari A. Brewer, RN, Darcy R. Kassner, BS, Amy E. Tooke, ATC, Liane M. Vadheim, RD, LN, CDE, and Tracy A. Vosler, MS, PT

Montana Department of Public Health and Human Services, Helena, Montana

Helen A. Amundson, RN, BSN, CDE, Marcene K. Butcher, RD, CDE, Dorothy Gohdes, MD, Taryn O. Hall, MPH, Todd S. Harwell, MPH, Steven D. Helgerson, MD, MPH, and Karl K. Vanderwood, MPH

Saint Vincent Healthcare, Billings, Montana

Lane Guyse, RD, LN, Charles R. McClave II, MD, Beverly McHugh, RD, LN, CNSD, and Jane Fitch Meszaros, RN, BSN, CDE

Saint Peters Hospital, Helena, Montana

Jennifer A. Colgrove, RD, Debra A. Jones, RD, Sue G. Larson, MS, RD, CDE, BC-ADM, Yvonne B. Tapper-Gardzina, MS, RD, and Jeanine M. Winchester

ACKCO American Indian Professional Services, Phoenix, Arizona

Carol Percy, RN, MS, and Cathy Manus, LPN

References

1. Narayan KM, Boyle JP, Thompson TJ, Sorensen SW, Williamson DF. Lifetime risk for diabetes mellitus in the United States. JAMA. 2003;290(14):1884-1890.
2. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 2002;346:393-403.
3. Ratner R, Goldberg R, Haffner S, et al; Diabetes Prevention Program Research Group. Impact of intensive lifestyle and metformin therapy on cardiovascular disease risk factors in the diabetes prevention program. Diabetes Care. 2005;28(4):888-894.
4. Orchard TJ, Temprosa M, Goldberg R, et al. The effect of metformin and intensive lifestyle intervention on the metabolic syndrome: the Diabetes Prevention Program randomized trial. Ann Intern Med. 2005;142(8):611-619.
5. Diabetes Prevention Program (DPP) Research Group. The Diabetes Prevention Program (DPP): description of lifestyle intervention. Diabetes Care. 2002;25:2165-2171.
6. Diabetes Prevention Program Research Group. Within-trial cost-effectiveness of lifestyle intervention or metformin for the primary prevention of type 2 diabetes. Diabetes Care. 2003;26(9):2518-2523.
7. Herman WH, Hoerger TJ, Brandle M, et al; Diabetes Prevention Program Research Group. The cost-effectiveness of lifestyle modification or metformin in preventing type 2 diabetes in adults with impaired glucose tolerance. Ann Intern Med. 2005;142(5):323-332.
8. Ackermann RT, Marrero DG. Adapting the Diabetes Prevention Program lifestyle intervention for delivery in the community: the YMCA model. Diabetes Educ. 2007;33(1):69, 74-75, 77-78.
9. Pagoto SL, Kantor L, Bodenlos JS, Gitkind M, Ma Y. Translating the diabetes prevention program into a hospital-based weight loss program. Health Psychol. 2008;27(1 suppl):S91-S98.
10. Aldana S, Barlow M, Smith R, et al. A worksite diabetes prevention program: two-year impact on employee health. AAOHN J. 2006;54:389-395.
11. Boltri JM, Davis-Smith YM, Seale JP, Shellenberger S, Okosun IS, Cornelius ME. Diabetes prevention in a faith-based setting: results of translational research. J Public Health Manag Pract. 2008;14(1):29-32.

12. Seidel MC, Powell RO, Zgibor JC, Siminerio LM, Piatt GA. Translating the Diabetes Prevention Program into an urban medically underserved community: a nonrandomized prospective intervention study. Diabetes Care. 2008;31(4):684-689.
13. Roubideaux Y, Beals J, Jiang L, Valdez SL, Manson SM, Acton K. Special diabetes programs for Indians diabetes prevention program: translating research into practice for American Indians and Alaska natives at risk for diabetes. Diabetes Care. 2008; 57(suppl 1):A248. Abstract 859-P.
14. Cramer JS, Sibley RF, Bartlett DP, Kahn LS, Loffredo L. An adaptation of the diabetes prevention program for use with high-risk, minority patients with type 2 diabetes. Diabetes Educ. 2007;33(3):503-508.
15. Eckel RH. Preventive cardiology by lifestyle intervention: opportunity and/or challenge? Presidential address at the 2005 American Heart Association Scientific Sessions. Circulation. 2006; 113(22):2657-2661.
16. Gotto AM Jr, Blackburn GL, Dailey GE III, et al. The metabolic syndrome: a call to action. Coron Artery Dis. 2006;17(1):77-80.
17. Grundy SM. Metabolic syndrome: connecting and reconciling cardiovascular and diabetes worlds. J Am Coll Cardiol. 2006; 47(6):1093-100.
18. Eckel RH, Kahn R, Robertson RM, Rizza RA. Preventing cardiovascular disease and diabetes: a call to action from the American Diabetes Association and the American Heart Association. Circulation. 2006;113(25):2943-2946.
19. Gohdes D, Amundson H, Oser CS, Helgerson SD, Harwell TS. How are we diagnosing and treating cardiometabolic risk in Montana? Prim Care Diabetes. Epub ahead of print, January 19, 2009.
20. US Bureau of the Census. http://factfinder.census.gov/. Accessed July 16, 2008.
21. Healthy Native Community Partnership. Native lifestyle balance curriculum. http://www.hncp.org/wst/hpdp/NLB. Accessed July 28, 2008.
22. Ackermann RT, Finch EA, Brizendine E, Zhou H, Marrero DG. Translating the Diabetes Prevention Program into the community. The DEPLOY Pilot Study. Am J Prev Med. 2008;35(4):357-363.
23. Hollis JF, Gullion CM, Stevens VJ, et al; Weight Loss Maintenance Trial Research Group. Weight loss during the intensive intervention phase of the weight-loss maintenance trial. Am J Prev Med. 2008;35(2):118-126.
24. Wilson PW, D'Agostino RB, Parise H, Sullivan L, Meigs JB. Metabolic syndrome as a precursor of cardiovascular disease and type 2 diabetes mellitus. Circulation. 2005;112(20):3066-3072.
25. National Institutes of Health. Clinical guidelines on the identification, evaluation, treatment of overweight and obesity in adults: the evidence report. Obes Res. 1998;6(suppl 2):51S-209S.
26. US Department of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention; 1996.
27. Lindström J, Ilanne-Parikka P, Peltonen M, et al. Finnish Diabetes Prevention Study Group. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. Lancet. 2006;368(9548):1673-1679.
28. Li G, Zhang P, Wang J, Gregg EW, et al. The long-term effect of lifestyle interventions to prevent diabetes in the China Da Qing Diabetes Prevention Study: a 20-year follow-up study. Lancet. 2008;371(9626):1783-1789.
29. Rosenzweig JL, Ferrannini E, Grundy SM, et al. Primary prevention of cardiovascular disease and type 2 diabetes in patients at metabolic risk: an endocrine society clinical practice guideline. J Clin Endocrinol Metab. 2008;93(10):3671-3689.
30. Garber AJ, Handelsman Y, Einhorn D, et al. Diagnosis and management of prediabetes in the continuum of hyperglycemia: when do the risks of diabetes begin? A consensus statement from the American College of Endocrinology and the American Association of Clinical Endocrinologists. Endocr Pract. 2008;14(7):933-946.
31. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HAW. 10-year follow-up of intensive glucose control in type 2 diabetes. N Engl J Med. 2008;359:1577-1589.
32. Ackermann RT, Marrero DG, Hicks KA, et al. An evaluation of cost sharing to finance a diet and physical activity intervention to prevent diabetes. Diabetes Care. 2006;29(6):1237-1241.
33. Mensing C, Boucher J, Cypress M, et al. National standards for diabetes self-management education. Diabetes Care. 2007;30 (suppl 1):S96-S103.

Pages 211-212, 215 and 221-222 were intentionally removed from this PDF.
In the print version, these pages were advertisements.